Weaving device.

DESCRIPTION

The invention relates to a weaving device comprising means for forming a shed consisting of warp yarns, with insertion means being disposed on one side or on both sides of the shed for inserting a weft yarn into the shed.

Weaving devices of the above kind are generally known, for example from Dutch patent application No. 73/09850. With this type of weaving devices, a weft yarn from a supply bobbin is connected to a projectile, also called shuttle, which projectile is launched by the insertion means disposed on either side of the shed, using a medium under pressure, for example compressed air, and carried through the shed via guides disposed in the shed.

A drawback of this known device is the fact that all the energy required for moving the projectile through the shed must be imparted to the projectile at the beginning of the movement, i.e. at the location of the insertion means. In order to be able to carry the projectile through a shed of reasonable width, a large amount of energy has be supplied to the projectile at the beginning of its movement, which means a very high initial velocity, resulting in high peak tensions in the weft yarn to be transported. Furthermore this means that the projectile needs to have a fairly high inert mass. These aspects of the known weaving device impose limitations on the functionality thereof as regards the speed, the complexity and the maximum width of the fabric to be manufactured.

The above limitations are partially overcome by a weaving device as described in Dutch patent application No. 1004173. In this weaving device auxiliary blowers are disposed in the shed, which auxiliary blowers are provided with outflow openings for the medium under pressure that impacts on an impact surface of the projectile to be guided

during operation so as to assist in the movement of the projectile through the shed. Using these aspects, it is no longer necessary to impart all the energy required for carrying the projectile through the shed to the projectile at the beginning of the shed. Although in fact the width of the shed is no longer bound by limitations when auxiliary blowers are used, it is still necessary to use a projectile having a high inert mass, and this embodiment of a known weaving device is more complex as regards its construction and control.

The object of the invention is to provide a weaving device as referred to in the introduction, which weaving device is of significantly simplified construction and which is much simpler to control. According to the invention, the weaving device is to that end characterized in that the weft yarn has been formed into a packed clew, which packed clew unwinds into an elongated weft yarn upon insertion into the shed. The above aspects obviate the need to use a projectile having a high inert mass and the related insertion means and braking means for moving and decelerating the movement of the projectile through the shed, resulting in a weaving device which is of significantly simplified construction and which is much simpler to control.

The lighter components (no heavy components are used) furthermore enable a much greater speed of operation of the weaving device according to the invention, which means high-speed weaving, for example with a much greater insertion speed, in terms of time, of weft yarns into the shed. More particularly, it is the clew rather than the yarn itself on which the forces are exerted upon insertion thereof. Now that no loose yarns are individually inserted into the shed any more, with a clewed weft yarn being inserted, peak tensions in the yarn are prevented, since it is the clew (rather than a yarn) that is now subjected to the acceleration forces that are exerted by the insertion means upon insertion.

Since the unwinding of the clew into a weft yarn upon

insertion into the shed takes place in a gradual manner, a substantially constant, low tension is present in the weft yarn, without the peak tension that usually occurs during the sudden braking action that takes place in the currently known weaving machines.

In a specific embodiment, in order to effect an improved unwinding of the packed clew into an elongated weft yarn in the shed, the insertion means are arranged to fix the packed clew upon insertion into the shed at a yarn section that projects from the clew. To that end, the insertion means may comprise a gripping element for fixing the yarn section.

According to the invention, in order to guarantee the correct functioning of the weaving device during operation and thus prevent failure, standstill or jamming of the weaving device and obtain an optimum weaving result, the packed clew has its own consistent shape.

In a specific embodiment, in order to guarantee a correct insertion of the clewed weft yarn during operation of the weaving device, the weft yarn of the packed clew is provided with a bonding agent, for example a glue or a wax. In another embodiment, ice is used as the bonding agent, more in particular "dry ice".

In another embodiment of the weaving device according to the invention, the packed clew can be moved through the shed by means of a carrier. The packed clew may be arranged round the carrier in one or more windings; in a specific embodiment, the carrier envelopes the packed clew at least partially. In the latter embodiment, the packed clew does not need to have a consistent shape, but the clew retains its shape as a result of the presence of the envelope.

After being inserted, the clew unwinds during its movement through the shed. The moment the clew has unwound into an elongated weft yarn, the carrier envelope may be intercepted at the end of the shed and be discharged, for example for forming a new clew.

In a specific embodiment, the carrier is made of a rigid

material, for example a plastic, or of a flexible material, for example a foil. In both embodiments the clewed weft yarn is given a consistent external shape, which still has a certain inert mass, however.

In a specific embodiment, the insertion means comprise an elongated tube, which tube is directed towards the shed with an open end thereof and which can be connected to means for supplying the medium under pressure at its other end. Said medium under pressure may be compressed air or water.

In a specific embodiment of a clewed weft yarn, the weft yarn has a certain, limited length, having at least one end projecting from the clew. In another functional embodiment, several clewed weft yarns are interconnected via intermediate yarn sections, which clewed weft yarns can subsequently be inserted into the shed one after another by the insertion means. Said several clewed weft yarns may be formed of one yarn, which clewed weft yarns may be present on a winding element in one or more windings.

The invention also relates to a weft yarn as described in the present application.

The invention will now be explained in more detail with reference to a drawing, in which:

Figs. 1 and 2 show a weaving device according to the prior art;

Figs. 3a-3e show various embodiments of a clewed weft yarn according to the invention;

Fig. 4 shows an embodiment of the insertion means of a weaving device according to the invention;

Figs. 5a-5b show further aspects of the invention.

In Figs. 1 and 2 an embodiment of a known weaving device is shown, for example the device that is described in Dutch patent application No. 73/09850 or Dutch patent No. 1004173.

The known weaving device comprises a lay 1 and means 2 for forming a shed 3 of warp yarns 4, which warp yarns 4 come from warp yarn

supply bobbins 5. A large number of dents 6, together forming the so-called "reed", are arranged on the lay 1, which dents can move between the warp yarns 4. A number of guides 7 are furthermore arranged on the lay 1 for guiding a projectile 8 from one side to the other side.

As is shown in the figure, the projectile 8 is present in an insertion station 9 disposed on the left-hand side of the shed 3, whilst a braking station 10 is disposed at the other side of the shed 3. A weft yarn 11 from a supply bobbin 12 can be connected to the projectile 8 in a known manner. A considerable amount of impulse energy is imparted to the projectile 8 by means of a medium under pressure, for example compressed air or water. As a result, the projectile 8 undergoes an acceleration and is moved or "shot" through the shed 3 at a high velocity, carrying along the weft yarn 11. The projectile 8 is also called the shuttle, therefore.

The projectile 8 that moves through the shed 3 at a high velocity must be decelerated on the other side of the shed 3 (on the right in Fig. 1). To that end, a braking station 10 is disposed directly beside the shed 3, which station 10 intercepts and decelerates the projectile as it leaves the shed 3. Likewise, the projectile 8 can be moved ("shot") from the right-hand side to the left-hand side of the shed 3 at a high velocity by an insertion station 9' (not shown) arranged analogously to the insertion station 9, which is disposed on the right-hand side of the shed 3.

A braking station 10' (not shown) is furthermore disposed at the location of the insertion station 9 for intercepting and decelerating a projectile 8 moving from the right-hand side to the left-hand side of the shed 3.

The high inert mass of the projectile 8 and the frequently considerable width L of the shed 3 require that the projectile 8 be moved through the shed 3 at a relatively high velocity. The acceleration forces thus generated lead to undesirable peak tensions in the weft yarn 11

being carried along, which may cause the yarn to break. In addition to that, the projectile 8 moving through the shed at a high velocity must be intercepted at the end of the shed and be decelerated by a separate braking station 10 (10'). Said deceleration, too, may lead to undesirable peak tensions in the weft yarn, especially in situations in which the weft yarn is used for decelerating the projectile.

In order to prevent in particular the undesirable peak tensions in the weft yarn 11, a lower initial speed of the projectile 8 being "shot" through the shed 3 is required, which also limits the maximum width of the shed 3. however. In the prior art it has already been proposed to embody the guides 7 that primarily function to guide the movement of the projectile 8 through the shed 3 as medium blowers. Said medium blowers 7 are mounted on the lay 1 and are connected to a medium supply line 17. Each guides 7 may be connected to a main medium supply line 19 via an electromagnetic valve 18.

Each guide 7 is provided with medium outflow openings (not shown in Fig. 1) oriented in the direction of transport of the projectile 8. The medium outflow openings are directed towards an impact surface of the projectile 8, so that the pressurised medium flowing out of the openings will impact on said impact surface and thus transmit the energy from the medium to the projectile 8. The auxiliary blowers 7 thus assist in the movement of the projectile 8 through a shed 3, thus obviating the need for a high initial speed to be imparted to the projectile by the insertion station 9.

This configuration of a known weaving device in any case leads to lower peak tensions in the weft yarn 11. The braking stations 10 for decelerating the weft yarn 11 and the projectile 8 arriving from the shed are still necessary, costly components of the weaving device, so that the known weaving devices still exhibit a certain degree of complexity.

Figs. 3a-3d show specific embodiments of an important

aspect of the weaving device according to the invention.

According to the invention, the weft yarn 11 has been formed into a clew 20, which is preferably given a consistent shape by using a binding or bonding agent 22, for example. In Fig. 3a, said binding or bonding agent 22 may be a glue. Also wax appears to be very suitable for giving the left yarn 11 a consistent shape, however. The bonding agent prevents the clew 20 from falling apart into a loose mass of yarn during its movement through the shed 3, which would inevitably lead to weaving faults and/or failure of the device.

By fixing the clew 20 at a yarn section 21 projecting from the clew 20, the clew 20 is unwound or uncoiled into an elongated, fully uncoiled weft yarn 11 during its movement through the shed 3. According to the invention, each clew 20, once it is fully uncoiled, thus has a length equal to the width L of the shed 3. See also Fig. 4.

Figs. 3b and 3c show other embodiments of the weft yarn 11 formed into a clew 20, which is surrounded by carriers 23 and 24, respectively. In Figs. 3b, the carrier 23 is in the form of an encasing of a hard yet light plastic, which surrounds the clew 20. The sleeve is provided with an opening 23a, which enables placement of the clew 23 into the encasing prior to insertion of the assembly into the shed on the one hand and unwinding of the clew 20 present in the encasing 23 on the other hand.

The moment the clew 20 has fully unwound into an elongated weft yarn 11, the carrier 23 will leave the shed 3 to be intercepted outside the shed 3, for example for reuse.

Fig. 3c shows a similar embodiment, in which the carrier is made of a flexible material, for example a foil. Analogously to the embodiment of Fig. 3b, the clew 20 does not have a consistent shape of itself in this embodiment, its shape being determined by the carrier 24 that surrounds the clew 20. As a result, the clew 20 will have a certain inert mass, too, which makes it possible to move said clew 20 through the

shed 3 by means of a medium under pressure.

The weft yarn 11 formed into a clew 20 unwinds from the foil casing 24 at the location indicated at 24a during its movement through the shed 3. At the end of the shed 3, the clew 20 has fully unwound into an elongated weft yarn 11, and the foil encasing is regarded as waste which, on account of its low weight, can easily be separated and be discharged, for example by being exhausted.

Another embodiment of the weft yarn 11 formed into a clew 20 as shown in Fig. 3a, which has its own consistent shape, uses ice, in particular dry ice, as the binding or bonding agent. Said embodiment may be realised, for example, by moisturising the clew 20 with water and subsequently freezing it. The ice particles will fragmentize at the location where the left yarn 11 is pulled off a clew 20 during the movement through the shed.

It is also possible to compress the clew 20, using carbon dioxide snow (dry ice), while it is being formed, so that a consistent shape can be obtained in this manner as well. In this case, too, the carbon dioxide ice will fragmentize upon insertion of the clew 20 into the shed 3. Said carbon dioxide ice will subsequently evaporate in the shed 3.

Yet another embodiment is shown in Fig. 3d, in which the weft yarn 11 is wound on a carrier 25 in one or more windings 20a-20f, thus forming a clew 20. This carrier, too, has a low inert mass and can be moved or "shot" through the shed 3 by suitable insertion means. The left yarn 11 will unwind from the carrier 25 during its movement through the shed 3. In this case, too, the carrier 25 can be intercepted at the end of the shed 3 and be reused.

In all the above embodiments the clew 20 is given a certain consistency of its own by the addition of means having a low inert mass. Said consistency makes it easier to handle the clew, for example position it in the insertion means. In addition it enables the insertion or

"shooting" of the clew into the shed at great velocity by the insertion means, using a medium under pressure.

It is also possible, however, to wind the weft yarn 11 into a clew 20 in a specific manner without making use of external, foreign auxiliary means (a bonding agent, an encasing or a carrier), which clew likewise has a consistent shape as a result of the winding method that is being used. This embodiment is shown in Fig. 3E. This embodiment, too, can be inserted into the shed at great velocity by the insertion means, using a medium under pressure.

Fig. 4 shows an embodiment of the insertion means for use with a weaving device according to the invention. The insertion means, indicated at 9 in Fig. 1, comprise an elongated cube 30 having an open end 30a, which is directed towards the shed 3. The other end 30b is provided with an opening that can be connected or coupled to means for supplying medium under pressure.

Present inside the elongated tube 30, which in fact functions as a launching tube, is a weft yarn 11 formed into a clew 20 in accordance with any one of the embodiments as shown in Figs. 2A-2D. The yarn section 21 projecting from the clew 20 is fixed by the launching tube 30 at the location indicated at 30c. The clew 20 is launched into the shed 3 from the tube as a result of the pressure buildup generated by feeding a certain amount of medium under pressure P to the space 31 between the tube 30 and the clew 20 via the opening 30b. By fixing the yarn section 21 in the launching tube 30 at the location indicated at 30c, the launched clew 20 unwinds into a full-length, elongated weft yarn 11 in the shed 3. After having launched a clew 20, the insertion means 9 may be readied for inserting a next clew 20 into the shed 3.

Said repeated "loading" and "unloading" of the launching tube 30 with a new clew 20, which, after being launched into the shed 3, unwinds into an elongated left yarn 11 having a length that is substantially equal to the width L of the shed 3, can be further

automated, especially if the various clews 20 are interconnected by means of intermediate yarn sections 21.

This embodiment is shown in Fig. 5a, which shows several clews 201-206, each comprising a packed weft yarn 111-116, which, in unwound form, has a length equal to or slightly smaller than the width L of the shed 3. See also Fig. 4. Intermediate yarn sections 211-216 are to be fixed by the insertion means 9, this in order to enable unwinding of the clew 201-206 into an elongated left yarn 11 in the shed 3.

In a specific embodiment, the various clews 201-206 are formed of a single yarn 26.

Fig. 5b shows yet another a specific embodiment of the insertion means 9, which, in addition to the launching tube 30, also comprise a winding element 35, on which the various weft yarns 111-1110 formed into clews 201-2010 are arranged in one or more windings. Rotation of the winding element 35 causing the windings of the clews 201-2010 to be unwound in the direction of the opening 30c of the launching tube 30. The opening 30c can be opened temporarily and be closed again for passing a clew 202, with the intermediate yarn section 211-212 being fixed each time the tube is opened and closed again.

By supplying medium under pressure via the opening 30b, the clew is shot into the shed 3, causing it to unwind into an elongated weft yarn 112.

Although the invention has been explained herein on the basis of a packed clew being inserted into the shed by the insertion means, using a medium under pressure (compressed air or a water jet), this aspect of the insertion means must not be construed as being overly limitative. Also other variants of insertion means are possible, as long as said means in part a movement to the packed clew or the carrier by means of impulse transmission. Also such variants are considered to fall within the scope of the appended claims.